

# Update on MRSA and Pets

## A One Health Perspective



University of Minnesota

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# Disclosure Information



- **I have the following financial relationships to disclose:**
  - Consultant for the Minnesota Department of Health
  - Grants and Research support from: CDC, USDA, NIH
- **I will not discuss off label use and/or investigational drug use in my presentation**

# Overview

## MRSA and Companion Animals



- Carriage of *Staph aureus* in people and their pets
- Clinical cases in the Veterinary Medical Center
- Zoonotic transmission? – Case Studies
- MRSA control and prevention

# MRSA

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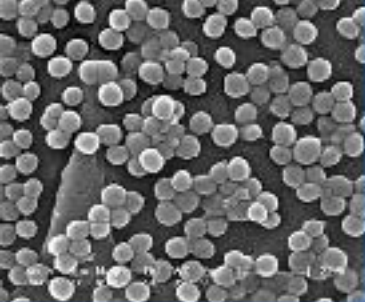
- Leading cause of pneumonia, surgical wound, and bloodstream infections in hospitalized patients
- Assumed that antibiotic use has led to selection and emergence of MRSA

# History of Methicillin-Resistant *Staphylococcus aureus* (MRSA)

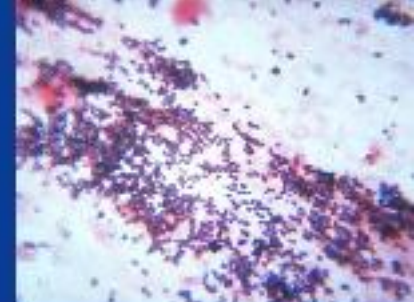
- Penicillin G introduced in 1941, penicillin-resistant (beta-lactamase producing) strains of *S. aureus* isolated in 1942
- Methicillin (first beta-lactamase stable penicillin) introduced in 1960, methicillin-resistant strains of *S. aureus* isolated in 1961 (U.K.)
- Late 1960s - MRSA identified as a nosocomial pathogen
- First U.S. hospital outbreak in 1968

# Human Nasal Colonization of *Staph aureus*, United States

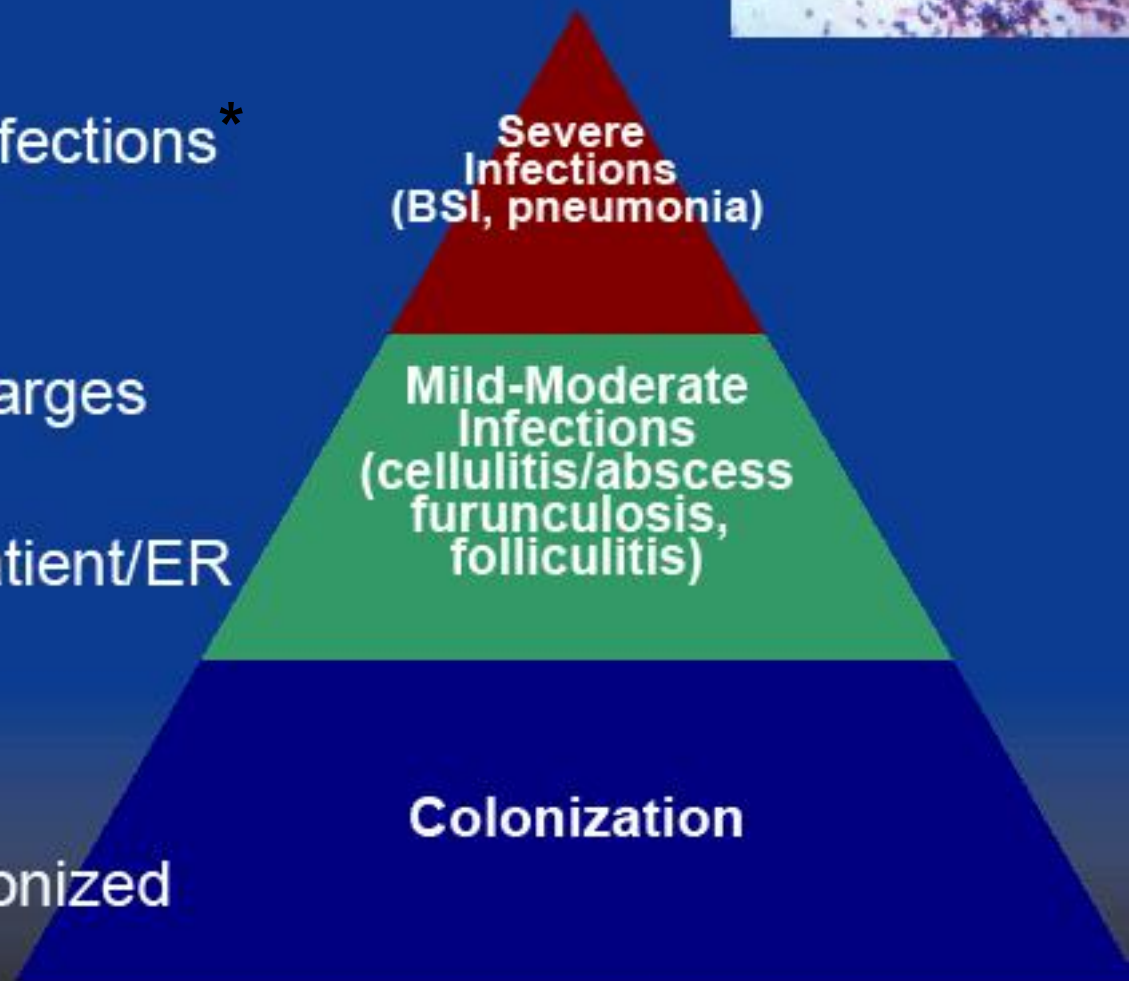
- Resistance to beta-lactam antimicrobials (all penicillins and cephalosporins) is determined by the presence of the *mecA* gene
- The prevalence of *Staph aureus* colonization in 2003-2004 was 29%
- The prevalence of MRSA colonization was 1.5%
- Majority of isolates were health-care associated strains (USA100 and USA800)



# Annual Estimates of MRSA, U.S.



- 94,000 new invasive infections\*
- 19,000 deaths
- 250,000 hospital discharges
- About 6-8 million outpatient/ER visits (increasing)
- 2.3 million persons colonized





**Table 1. Annual death rates in the United States for selected infectious diseases.**

Infectious disease	No. of deaths (estimated)	Year	Reference
MRSA infection	19,000 <sup>a</sup>	2005	[14]
AIDS	15,798	2004	[15]
Tuberculosis	662	2004	[16]
Viral hepatitis	5793	2002	[17]
SARS	0	All	[18]
Avian influenza	0	All	[19]

**NOTE.** MRSA, methicillin-resistant *Staphylococcus aureus*; SARS, severe acute respiratory syndrome.

<sup>a</sup> In-hospital deaths.



# MRSA



- Healthcare-associated MRSA (HA-MRSA)
- Community-associated infections (CA-MRSA)
- Livestock-associated MRSA (LA-MRSA)
- Unfortunately, these lines are not so clean – an increasing number of CA-MRSA cases are found in health care settings.

# MRSA and Companion Animals

- *Staph (pseud)intermedius* is the most common skin flora of dogs and cats
- *S. aureus* isolation from dogs and cats is infrequent (generally <1%)

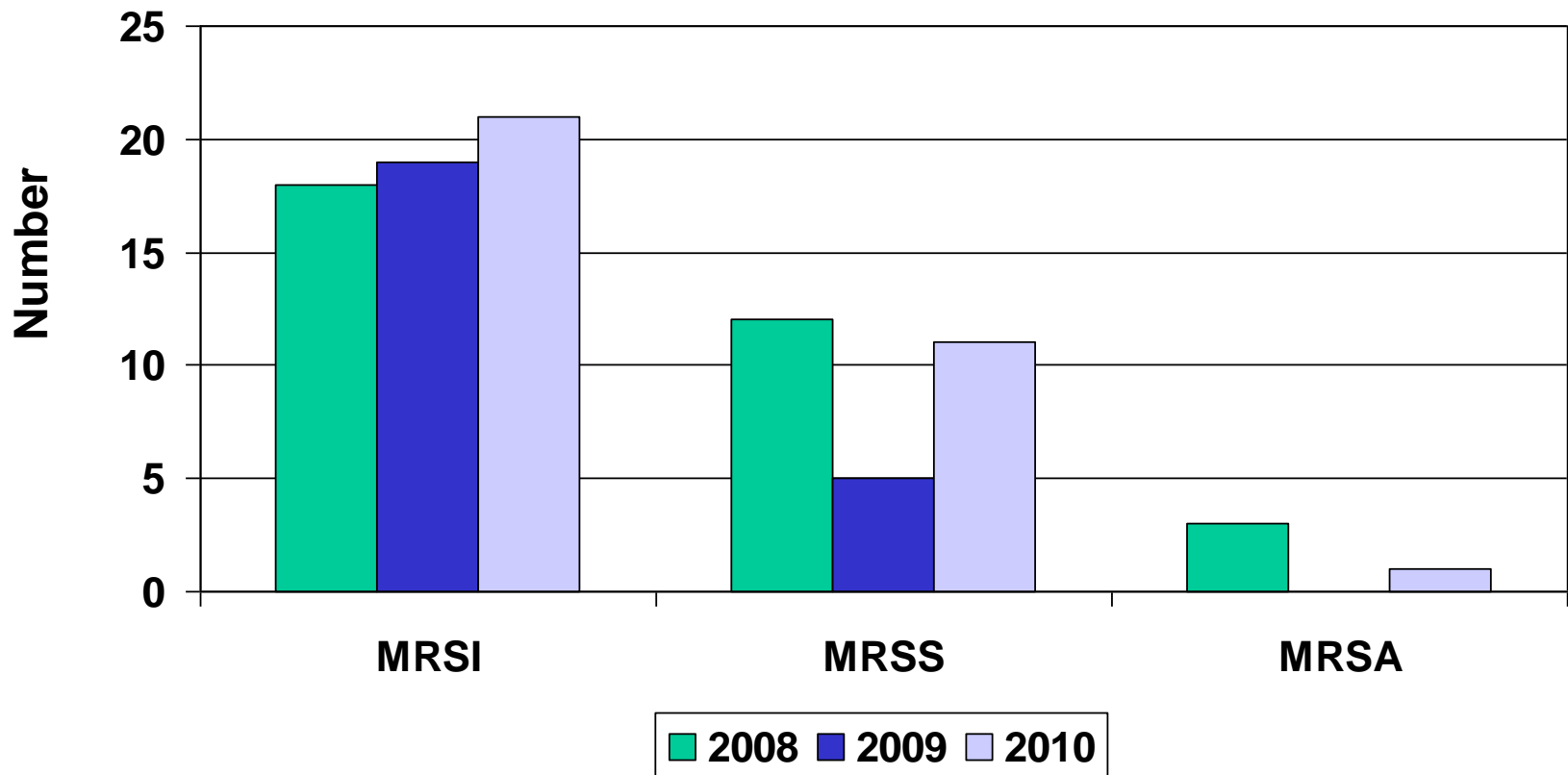


# MRSA Cases at the University of Minnesota, Veterinary Medical Center

- The University of Minnesota, VMC Small Animal Veterinary Clinic sees between 35,000 to 40,000 admissions per year



# Clinically related *Staphylococcus* sp. identified through the Dermatology Service



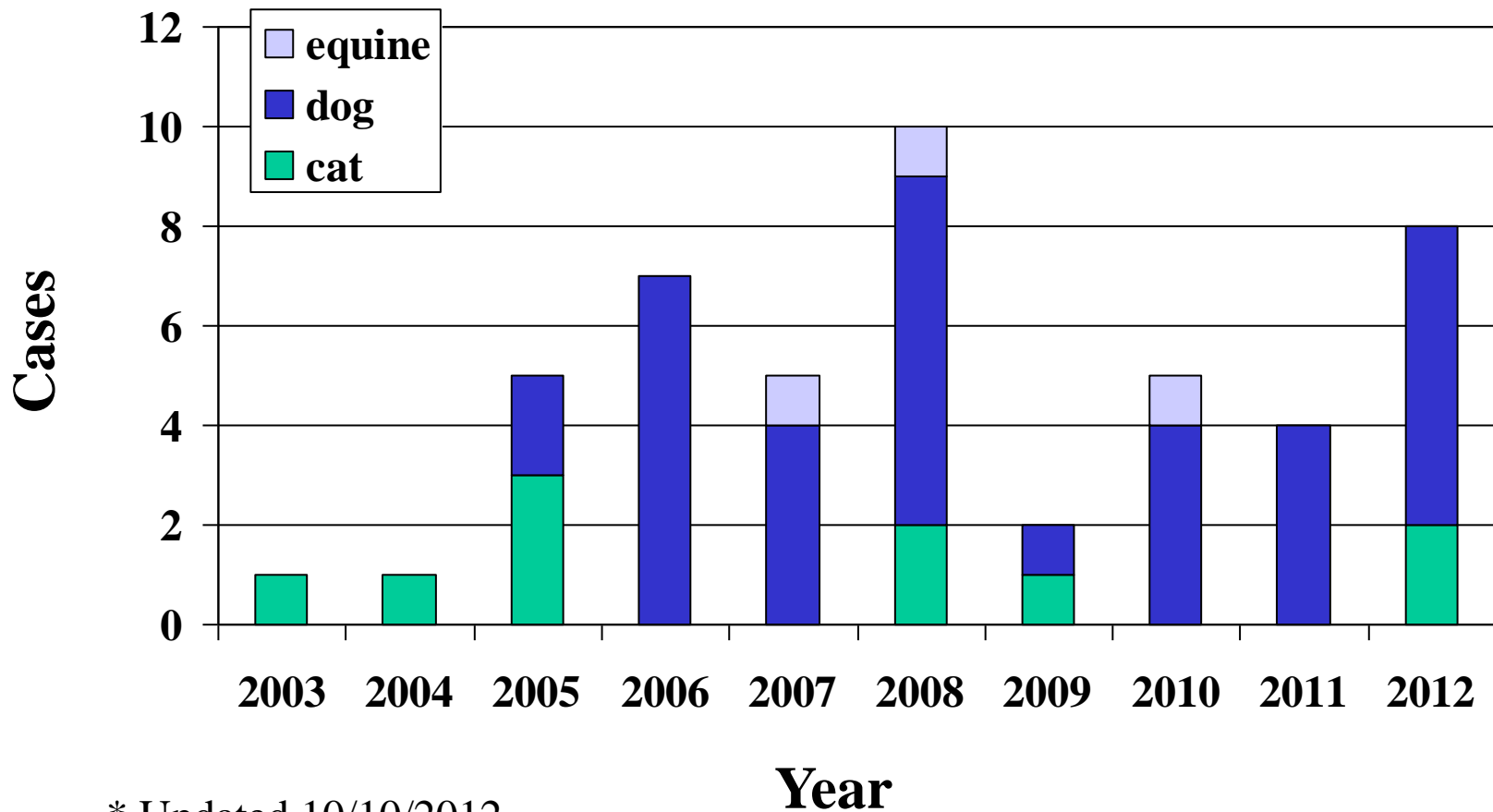
Collection through 7/15/11

# MRSA Cases at the University of Minnesota, Veterinary Medical Center



- From 2003 to 2012, 47 clinical MRSA cases have been identified from:
  - 10 cats
  - 34 dogs
  - 3 horses

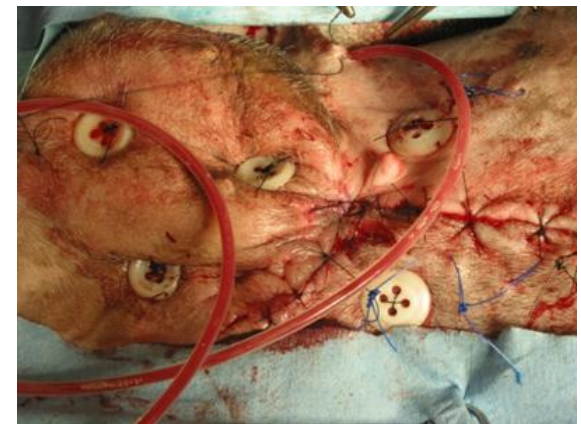
# MRSA Clinical Infections at the University of Minnesota, Veterinary Medical Center, 2003-2012



\* Updated 10/10/2012

# Clinical Presentation in Companion Animals

- Majority are non-healing soft tissue or post surgical infections
- Surgical implant infections
- Ex. Hit-by-Car, degloving injury (Case #4)





# Case Series of MRSA Cases at the University of Minnesota, VMC



- Owners are asked about potential risk factors
  - Recent hospitalization
  - Occupation
  - Visits to long-term care facilities
  - Previous MRSA infections
- Owners were provided information and recommendations to prevent MRSA infection

# MRSA Cases at the University of Minnesota, Veterinary Medical Center

- Owner information collected (n=37)
  - Health care worker (n=12)
  - No identified risk factor (n=11)
  - Care of ill family member (n=5)
  - Family member recently diagnosed (n=4)
  - Recent hospitalization (n=3)
  - Shelter animal (n=2)

# Case Investigation

- On September 2008, “Peaches” was evaluated at the Veterinary Medical Center for blood in her urine
- Peaches is a spayed female cat with a history of rear leg paresis and urine incontinence, requiring routine bladder expression
- She is a resident at a **pet sanctuary** for severely debilitated animals
- MRSA was isolated from a urine culture



# Case Investigation

- At discharge, the owner was encouraged to house “Peaches” in a separate facility until resolution of UTI and no evidence of nasal colonization
- A site visit was arranged
- Facility housed 230 animals in several buildings; 20 employees
- “Peaches” was housed in a room with 50 animals (mostly adult cats)



# Case Investigation

- 14 cats and 9 environmental samples were collected
- Follow-up cultures on “Peaches” were negative (2 negative cultures)
- 2 of 14 cats were colonized with MRSA
- Sink drain was culture positive for MRSA
- All isolates were indistinguishable by PFGE



# Debrief



- Additional cleaning, hygiene, and disinfection recommendations were provided
- Source? Recently, hospitalized worker?
- Common clone circulated among the cats?
- Infection/colonization appeared transient in index case
- Treatment for asymptomatic animals? – none

# Addendum



- Peaches and another cat from the same shelter presented in 2012
- Both were cultured positive for MRSA
  - PFGE results were indistinguishable (2008 and 2012 isolates)
- Suggest on-going transmission in the shelter
- Enhanced the VMC contact precautions for all shelter animals



# Zoonotic Transmission?

- These clinic cases served as impetus to explore the human-animal relationship
- Highlights from 3 studies
  - Animals in long-term care facilities
  - Pets of children recently diagnosed with CA-MRSA
  - Therapy dogs and their owners



# Study 1: MRSA in Resident Animals of a Long-term Care Facility



- Loneliness and depression are common issues afflicting long-term care residents
- To alleviate these feelings, some long-term care facilities provide opportunities for residents to regularly interact with pets, plants, and children
- Many of these facilities have resident animals

# MRSA in Resident Animals of a Long-term Care Facility

- Study Purpose:
  - Document the prevalence of MRSA among resident pets



Photographs by Mark Sauer/MesaDaily News via Associated Press  
Dickens, a therapy dog, sat on the lap of Bea Morrison, a resident of the Arrowhead Senior Living Center, while she talked with the dog's owner, Debbie Motley. Therapy dogs must remain calm when surrounded by wheelchairs, walkers and people who may move erratically.

**Therapy dogs give laps of love**

# MRSA in Resident Animals of a Long Term Care Facility



- During the summer of 2006, a longitudinal study was initiated, where weekly samples were taken from resident animals
- Facility A housed 108 residents on 3 floors
  - There were 12 resident animals (11 cats and 1 dog)
  - Animals moved freely within the facility

# MRSA in Resident Animals of a Long Term Care Facility



- 19 *Staph* isolates were cultured from 88 samples
  - 12 of 19 were oxacillin-sensitive isolates
  - 7 were oxacillin-resistant (MRSA)
- MRSA isolates were from 2 cats
- Isolates were USA100 (Health-care associated strains)

# Study 1 - Results

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- In Facility A, MRSA+ pets were found on floors with incident human cases
- Cats appeared to be transiently colonized with MRSA



## Study 2. Pets and CA-MRSA Cases (Household Transmission Study)



- Done in collaboration with the Minnesota Department of Health (MDH)
- The goal was to determine prevalence of MRSA in pets living in households with children diagnosed with CA-MRSA
- Our staff accompanied MDH researchers to sample household pets



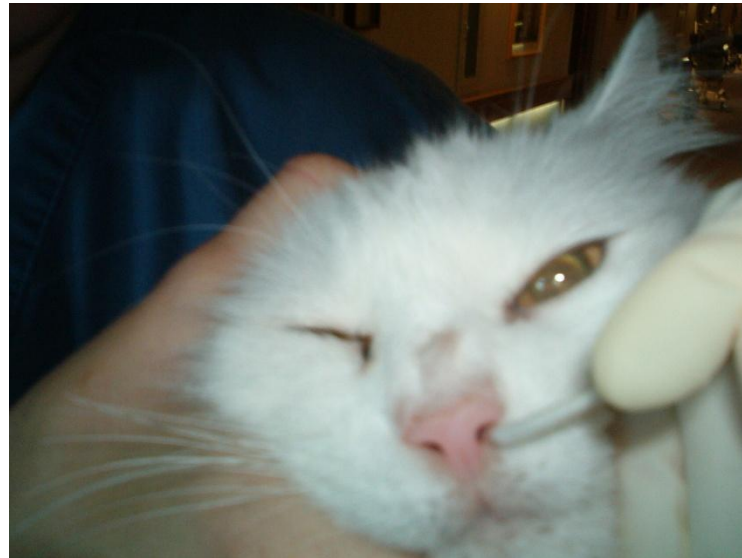
## Study 2. Pets and CA- MRSA Cases (Household Transmission Study)



- 94 eligible households (7/06 through 1/31/07)
  - Households are visited 3 times (Day 0, 6 months, and 12 months)
- 42 households (45%) had a dog or cat
- 28 (67%) of 42 households were enrolled in the pet study

# Study 2. Pets and CA- MRSA Cases (Household Transmission Study)

- 149 nasal and rectal swabs were collected during 60 visits
  - 18 dogs
  - 11 cats



# Study 2. Pets and CA- MRSA Cases

## Results



- Pets in 2 (7%) of 28 households were MRSA positive
  - Case 1 = 8 year old DSH feline
  - Case 2 = 2 year old poodle
- No MRSA associated illness was recognized in either cat
- MRSA strains were USA300
- Cases 1 and 2 were only positive on 1 of the 3 visits

# Study 3. Animal Assisted Activities in Health Care Settings



Photographs by Mark Sauer/Mesabi Daily News via Associated Press

**Dickens, a therapy dog, sat on the lap of Bea Morrison, a resident of the Arrowhead Senior Living Center, while she talked with the dog's owner, Debbie Motley. Therapy dogs must remain calm when surrounded by wheelchairs, walkers and people who may move erratically.**

## Therapy dogs give laps of love

# MRSA among Therapy Dogs and Their Handlers

- 10 therapy dogs were sampled weekly for 10 weeks
  - Nasal and rectal swabs
  - Questionnaire to determine location, frequency of visits, length of visits, type of interactions
- Handlers were sampled
  - Week 1, 5, and 10
  - Nasal swabs (self-collected)



# MRSA among Therapy Dogs and Their Handlers

- From dogs, 182 nasal and rectal swabs were collected
- From handlers, 26 nasal swabs were collected
- MRSA was recovered from 2 dogs and their handlers
- All isolates were healthcare associated strains and indistinguishable (USA100)



# Findings and Questions



- Dogs were transiently colonized
- Is there a risk to patients?
- Is there a risk to the therapy dogs?



# Do Visitation Animals Transmit Disease?



- There have been no reported outbreaks attributed to visitation programs
- However:
  - They can carry infectious agents
  - They can acquire infectious agents while visiting
  - There are limited guidelines for dogs visiting healthcare facilities
  - Guidelines were published recently (Am J Infect Control 2008)

# Issues and Collective Strategies



- Message to clients
- Infection control strategies
  - The role of the environment
- Antibiotic usage
- Learn from collective sources – i.e. infection preventionists, microbiologists, health-care providers

# Messages:

## Colonization/Carriage



- Healthy pets can be colonized for variable lengths of time
  - In longitudinal studies, carriage was generally less than 2 weeks

# Client Education

- The owners were instructed to consult with their healthcare provider
- Encouraged to practice good hand hygiene
- Clients were given educational materials
  - <http://www.cvm.umn.edu/img/assets/8961/MRSA09-26-2007.pdf>



# Environmental Contamination in Veterinary Settings



Setting	%	# Surfaces
Small Animal Referral Clinic (Loeffler, 2005)	10%	30
Canadian Equine Hospital (Weese, 2004)	9.6%	260
UK University Veterinary Hospital (Heller, 2009)	1.4%	140
Veterinary Teaching Hospital (Hoet, 2011)	12%	156

# Keyboard Study

## VMC, 2011

Keyboard Area	Keyboards Sampled	Luminometer (rlu)	Staph Recovery <sup>1</sup>
Dermatology	3	2300-2900	5-6
Treatment Room	3	2700-4000	2-3
Office	1	1900	3

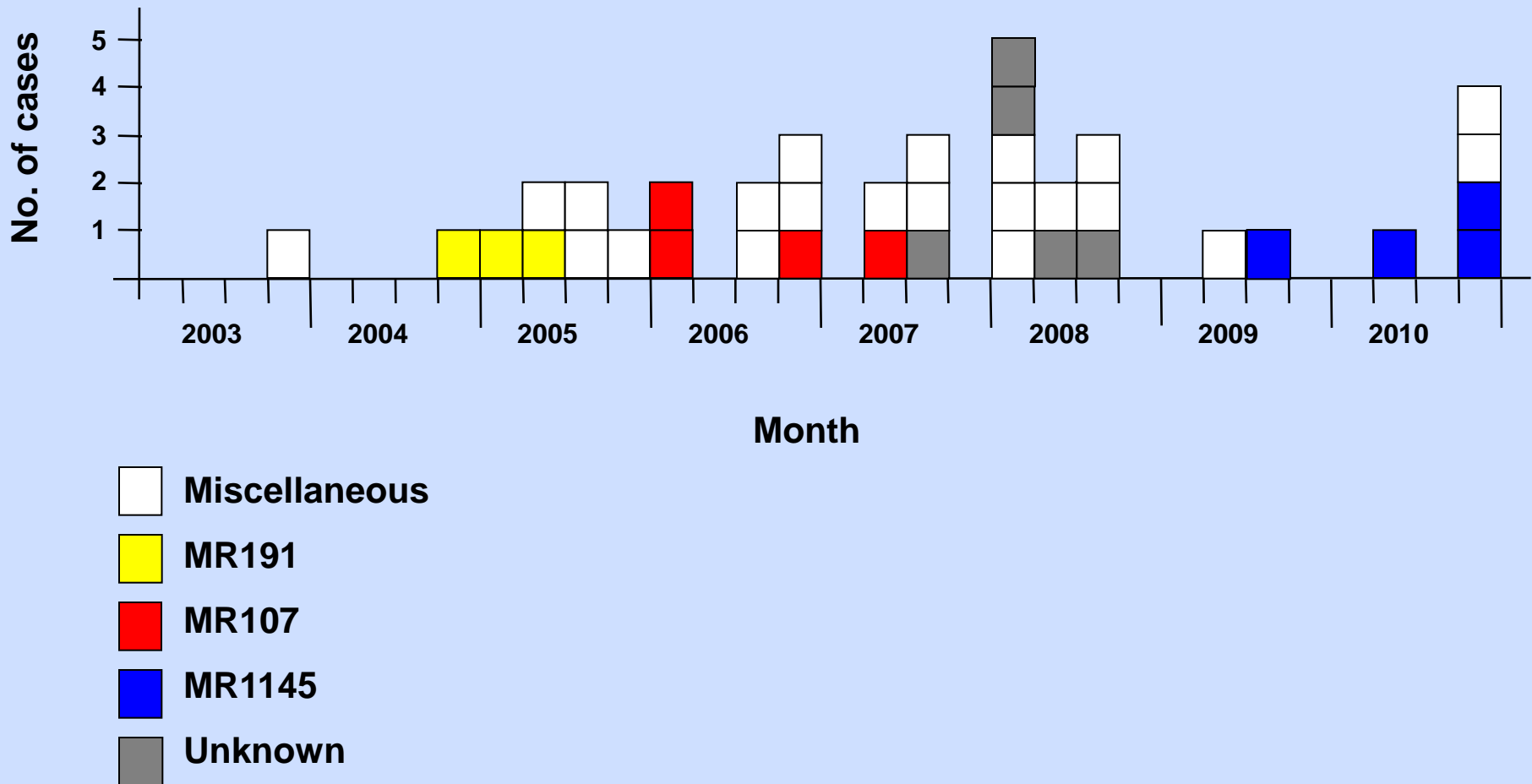
<sup>1</sup>Number recovered per site over a 10 week period

# Keyboard Study

<b>Keyboard Area</b>	<b>Samples per location</b>	<b>No Intervention (n=35)</b>	<b>Alcohol Wipe (n=14)</b>	<b>Disinfectant (n=21)</b>
<b>Dermatology</b>	30	12	0	4
<b>Treatment Room</b>	30	5	1	0
<b>Office</b>	10	3	0	0
<b>Total</b>	70	20	1	4

# Clinical Cases of *MRSA*

*University of Minnesota Veterinary Medical Center  
2003-2010*





# Antimicrobial Use



- Antibiotic use may select for MRSA colonization
  - $\beta$ -lactam and fluoroquinolones are commonly used in Small Animal Practice
- Good infection control practices and prudent antimicrobial use are key strategies
  - Contact precautions

# Antimicrobial Use



- Discourage the use of critically important antimicrobials (glycopeptides, oxazolidones, streptogramins) - increases risk for emergence and spread
- Prevention and management of MRSA should not rely on use of antimicrobials

# Conclusions

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- Pets with MRSA likely acquire their infection from their owners



# Conclusions



- Need to emphasize precautionary measures (i.e. hand hygiene) to pet owners
- Important to describe the potential risk of transmission from and/or to pets

# Infection Control and MRSA

- Bugs, like MRSA, are constantly changing and creating new challenges
- Important to recognize these challenges and take precautions
- Hand washing is one of the most important and cost effective strategies!



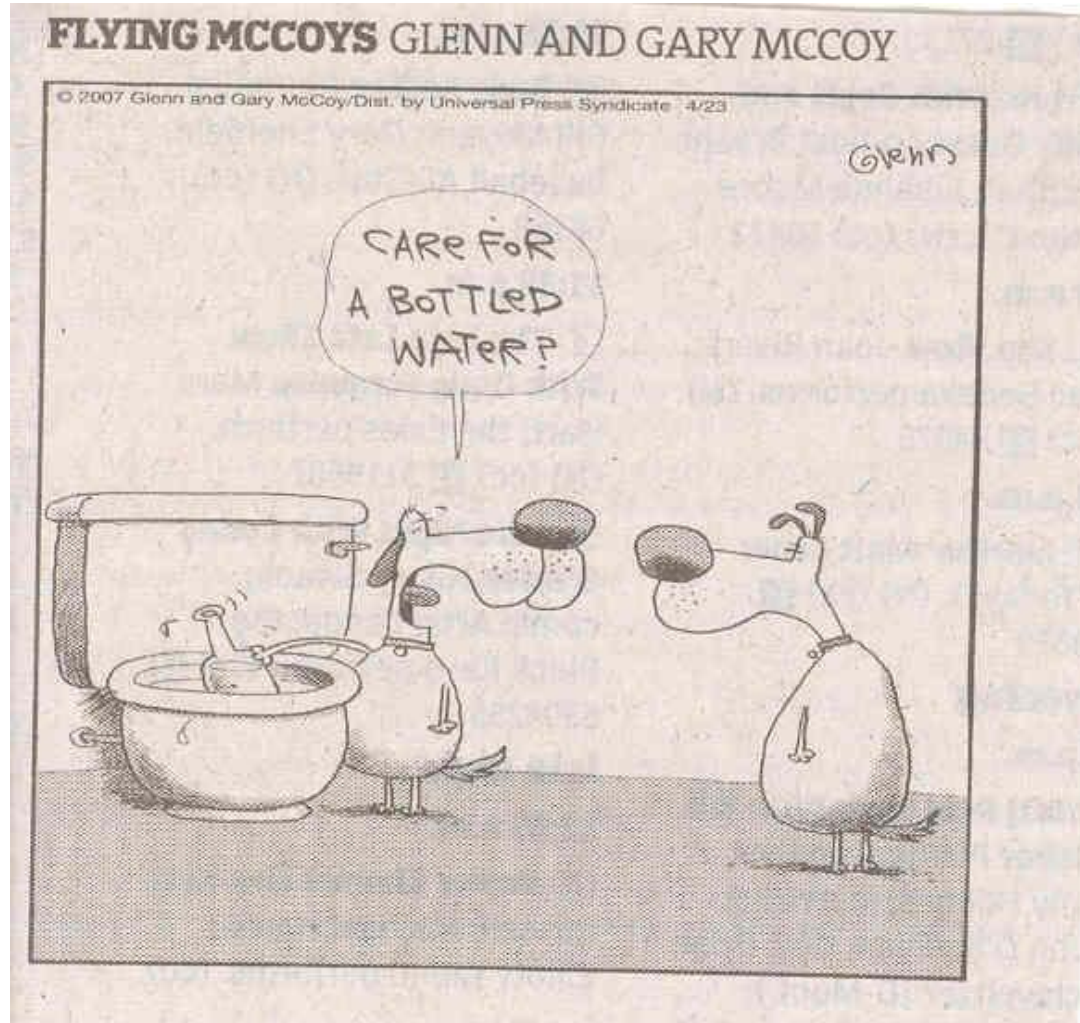
# Acknowledgements

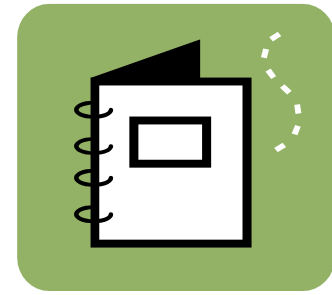


- **Special thanks to my colleagues:**
  - Minnesota Department of Health
  - Minnesota therapy dog participants
  - Andrea Johnson
  - Katherine Waters
  - Minnesota Veterinary Diagnostic Laboratory



# Questions





# Resources

- Compendium of Veterinary Standard Precautions for Zoonotic Disease Prevention in Veterinary Personnel. Nat Assoc. State Public Health Veterinarians (NASPHV) JAVMA 2010;233:415-432  
<http://www.nasphv.org/Documents/VeterinaryPrecautions.pdf>
- BSAVA. BSAVA 2007: British Small Animal Veterinary Association, 2007. MRSA practice guidelines  
[www.bsava.com/advice/MRSA](http://www.bsava.com/advice/MRSA)
- Infection Prevention and Control Best Practices. Canadian Committee on Antibiotic Resistance. 2008  
[http://www.wormsandgermsblog.com/uploads/file/CCAR%20Guidelines%20Final\(2\).pdf](http://www.wormsandgermsblog.com/uploads/file/CCAR%20Guidelines%20Final(2).pdf)